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Novelties and Notes in North American *Aristida* (Gramineae)

Kelly W. Allred

Range Science Herbarium, Department of Animal & Range Sciences,
New Mexico State University, Las Cruces, New Mexico 88003, U.S.A.

Jesús Valdés-Reyna

Departamento de Botánica, Universidad Autónoma Agraria "Antonio Narro,"
Saltillo, Coahuila 25315, Mexico

ABSTRACT. New taxa of *Aristida* include three related to *A. schiedeana* Trinius & Ruprecht (*A. petersonii* sp. nov., *A. eludens* sp. nov., and *A. spanospicula* sp. nov.) and one variety of *A. purpurea* Nuttall (var. *perplexa* var. nov.). Two species are reduced in rank (*A. schiedeana* var. *orcuttiana* [Vasey] comb. nov. and *A. purpurea* forma *brownii* [Warnock] comb. nov.), and one species is reinstated (*A. curvifolia* Fournier). A key is given for the *A. schiedeana* complex.

RESUMEN. Nuevos taxa de *Aristida* que incluyen tres especies con las aristas laterales reducidas, relacionadas con *A. schiedeana* Trinius & Ruprecht (*A. petersonii* sp. nov., *A. eludens* sp. nov., y *A. spanospicula* sp. nov.) y una variedad con las aristas laterales desarrolladas de *A. purpurea* Nuttall (var. *perplexa* var. nov.) son descritos. Dos especies son reducidas en rango (*A. schiedeana* var. *orcuttiana* [Vasey] comb. nov. y *A. purpurea* forma *brownii* [Warnock] comb. nov.) y una especie es reinstalada (*A. curvifolia* Fournier). Una clave para el complejo *A. schiedeana* es presentada.

The genus *Aristida* (Arundinoideae: Aristideae) comprises approximately 300 species found throughout the world, but its members are particularly frequent in warm, semiarid environments. Many species have three awns terminating the single floret, but it is not uncommon to find single-awned relatives of three-awned taxa. Species are notorious for their taxonomic difficulty, due partly, we believe, to undescribed variation that obscures the taxonomic boundaries. Major revisionary efforts include those of Henrard (1927, 1928, 1929) and Hitchcock (1924, 1935).

Aristida petersonii Allred & Valdés-Reyna, sp. nov. TYPE: Mexico. Oaxaca: 7.7 km NW of Tlaxiaco on road to San Juan Mixtepec, steep slopes with *Pinus, Quercus,* and *Arbutus,* elev. 2020 m, 2 Sep. 1990, *P. M. Peterson & A. Campos-Villanueva 9731* (holotype, NMCR; isotypes, ANSM, US). Figure 1.

Species nova propria vaginis lanosis, glumis glabris et valde inversis (primis secundis longioribus), paniculis angustis, rostris tortis lemmatum, et aristis singularibus a congeneribus Americanae borealis diversa.

Plants perennial, tufted; *culms* 50–100 cm tall, erect, unbranched except for basal tillering; *internodes* glabrous, striate, terete. *Sheaths* striate, shorter than the internodes, rounded on the back, loosely lanose, the hairs curling and tangled, the upper sheaths sparsely lanose to glabrous; *collars* often with a tuft of longer cobwebby hairs at the corners; throat glabrous except for the ligule. *Ligules* a minute fringe of hairs less than 0.5 mm long. *Blades* glabrous, flat when fresh and mature (new leaves convolute), folded upon drying, 15–30 cm long, 2–2.5 mm wide when flat, the lateral nerves generally coalescent and the margin thickened, the

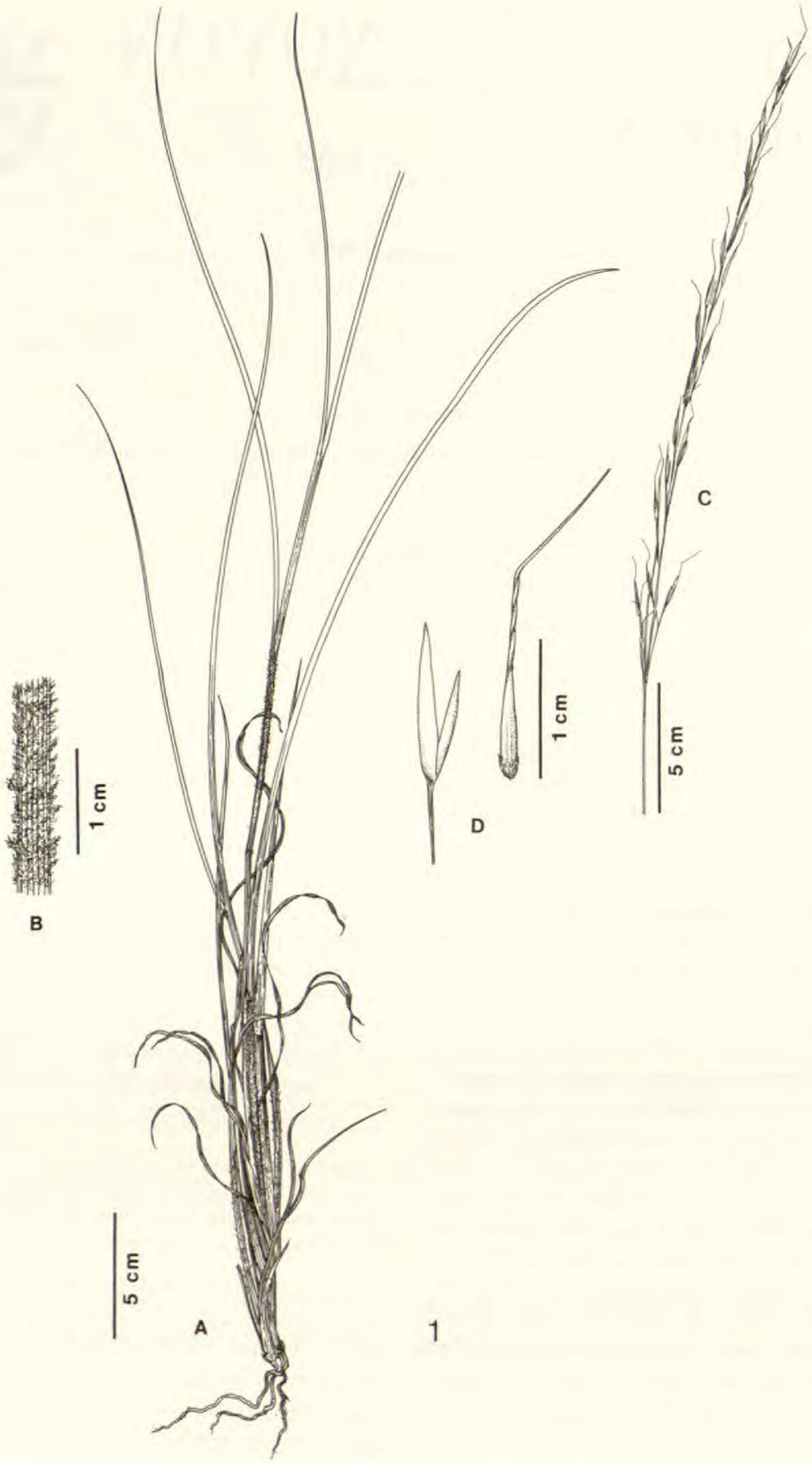

Figure 1. *Aristida petersonii* Allred & Valdés-Reyna (*Peterson & Campos-Villanueva 9731*). —A. Vegetative habit. —B. Sheath pubescence. —C. Inflorescence. —D. Spikelet: glumes left, floret right.

Figure 2. Geographic distributions of *Aristida petersonii* Allred & Valdés-Reyna (stars), *A. eludens* Allred & Valdés-Reyna (closed circles), and *A. spanospicula* Allred & Valdés-Reyna (squares).

marginal veins ca. 0.5 mm wide. *Panicles* 20–30 cm long, narrow, contracted, erect, the nodes glabrous; *primary branches* few, single or paired at the nodes, erect to appressed, 4- to 8-flowered, the lower ones 6–12 cm long; *secondary branches* weakly developed, 2- to 3-flowered, appressed; *pulvini* absent in the axils of the primary and secondary branches and pedicels, the spikelets thus appressed along the branches and main axis. *Glumes* glabrous, inverse, membranous and sub-hyaline, 1-nerved, light tan to purplish, the apices acute but not awned, the second glume ½ to ⅔ the length of the first; *first glume* (9–)10–13 mm long; *second glume* 6–7 mm long. *Lemmas* glabrous, mottled, 7–8 mm long from the base of the callus to the twisted portion of the beak; *beak* prominently twisted, (4–)5–6 mm long; *central awn* not twisted, geniculate-bent, 7–9 mm long; *lateral awns* completely reduced, represented by tiny points ca. 0.1 mm long at the end of the beak; *callus* ca. 0.5 mm long, with straight hairs to 1 mm long. *Palea* completely enclosed by the lemma, 2-nerved, hyaline, obtuse to rounded, 1–1.5 mm long. *Lodicules* 2, flabellate, 1–1.5 mm long. *Caryopsis* fusiform, chestnut-brown, 4.5–5.5 mm long.

Flowering known only from September, but presumed August–October. *Distribution.* Pine/oak/juniper woodlands; Mexico, known only from south-central Oaxaca (Fig. 2).

The specific epithet, *petersonii,* honors the collector of this species, Paul M. Peterson of the Smithsonian Institution.

Aristida petersonii is one of three perennial species in North America with lanate or floccose sheaths, the other two being *A. lanosa* Muhlenberg ex Elliott and *A. scribneriana* A. S. Hitchcock. *Aristida lanosa,* of the southeastern United States, differs in having sheaths mostly longer than the internodes, blades 2–6 mm wide, panicles mostly 30–70 cm long with lanose tufts in the branch axils, longer glumes (though they share the inverse position), and three well-developed awns. *Aristida scribneriana,* of the central highlands of Mexico, differs in having lanose internodes (including the peduncles) and blades (both surfaces), sparsely vil-

lous glumes that are nearly equal in length, and normally three well-developed awns. Other single-awned *Aristida* with narrow panicles that have glabrous (or very sparsely pilose) sheaths and equal glumes are *A. eludens, A. spanospicula,* and epulvinate forms of *A. pansa. Aristida petersonii* is the only North American *Aristida* with lanose sheaths, narrow panicles, glabrous glumes in the inverse position, and single-awned spikelets.

Paratypes. MEXICO. **Oaxaca:** 24.5 km W of Tlaxiaco and 7.4 km NE of San Juan Mixtepec, gravelly slopes with *Pinus, Quercus, Arbutus* and scattered *Juniperus*, elev. 2220 m, 3 Sep. 1990, *P. M. Peterson & A. Campos-Villanueva 9746* (ANSM, NMCR, US).

Aristida schiedeana Trinius & Ruprecht Complex

The *Aristida schiedeana* complex includes *A. schiedeana, A. orcuttiana* Vasey, *A. laxa* Cavanilles, and the two new species *A. eludens* and *A. spanospicula.* This complex is characterized by having flat blades often curling like wood shavings, generally equal glumes, a twisted lemma beak, and single awns (except *A. laxa*). Its members are customarily found as sparse understory in pine/oak forests of the Mexican and Central American central cordilleran mountain ranges.

Aristida eludens Allred & Valdés-Reyna, sp. nov. TYPE: Mexico. Coahuila: San Lorenzo Canyon, ca. 8 km S of Saltillo, mountain scrub grassland vegetation with *Berberis, Bouteloua, Hilaria, Dasylirion,* very rocky sandy loam, flat bajada on N-facing side of canyon, 6000 ft. (1830 m), 3 Sep. 1991, *J. Valdés-Reyna 2254* (holotype, ANSM; isotype, NMSU). Figure 3.

Species nova laminis ubi vivis planis vel plicatis laxe, paniculis angustis absque pulvinis axillaribus praeter interdum ramos infimos, glumis subaequalibus, et aristis singularibus a congeneribus Americanae borealis diversa.

Plants perennial, tufted; *culms* (35–)40–65(–80) cm tall, erect, branching only at the base; *internodes* terete, glabrous. *Leaves* basal and cauline, light green. *Sheaths* longer than the internodes, glabrous or scaberulous except for the summit, rounded on the back; *collars* with a tuft of cobwebby hairs at the corners (becoming glabrous upwards), sometimes with a line of minute hairs across the back; *throat* glabrous or puberulent. *Ligules* a fringe of hairs 0.2–0.3 mm long. *Blades* flat or loosely folded when fresh, rolled upon drying, glabrous or scaberulous abaxially, puberulent or glabrate adaxially especially toward the base, 12–35 cm long, 1–1.5 mm wide when flat. *Panicles* 10–22 cm long and 1–2 cm wide, with 16 or more spikelets, narrow, contracted, the nodes glabrous; *primary branches* erect, appressed to the main axis except occasionally the lowermost branch divaricate, naked at the base, the lower ones 5–9 cm long; *pulvini* absent, the spikelets appressed, only occasionally present in the axil of the lowermost branch and causing it to spread from the axis. *Glumes* glabrous, brownish, subequal or the first slightly shorter or longer, 1-nerved, 8–13 mm long, the apices acute and often with a mucro. Lemmas glabrous, mottled, 10–13 mm long from the base of the callus to the divergence of the awns; *beak* twisted, (3–)4–5 mm long; *central awn* not twisted, geniculate-bent, 5–10 mm long; *lateral awns* highly reduced, erect, 0.1–3 mm long; *callus* 0.5–1 mm long with stiff hairs ca. 1 mm long. *Paleas* completely enclosed by the lemma, 2-nerved, hyaline, rounded, ca. 1 mm long, shorter than the lodicules. *Stamens* 3, the anthers 2–2.5 mm long. *Lodicules* 2, flabellate, 1–1.5 mm long. *Caryopses* fusiform, chestnut-brown, ca. 6 mm long.

Flowering April–May, August–November. *Distribution.* Desert scrub/grassland habitats in calcareous soil, but extending up into the pine/oak zones; Mexico, in the states of Chihuahua, Coahuila, Durango, Guanajuato, Nuevo León, Oaxaca, Querétaro, and San Luis Potosí (Fig. 2).

The epithet *eludens* refers to the tendency of plants of this species to grow only within the branches and foliage of protective shrubs, evading, as it were, grazing animals.

Aristida eludens is the desert scrub/grassland representative of the *A. schiedeana* complex. *Aristida eludens* is distinguished most easily from the other species of the complex by possessing contracted panicles where the primary branches lack pulvini; it also differs by having cauline leaves with non-coiling blades and by the habitat. *Aristida eludens* occurs mostly in the desert scrub and semi-desert grasslands of northern Mexico, and only infrequently extends into the lower reaches of adjacent pine/oak communities. It has not been found to grow sympatrically with any of the other species of the complex. Consistent with the other members of the complex, its blades are nearly always flat or only loosely folded in the natural state (this may be obscure in dried specimens), though they do not coil like wood shavings. The flat blades contrast with the tightly involute blades of sympatric *A. pansa* Wooton & Standley and *A. purpurea* Nuttall s.l. Although the panicles of *A. eludens* usually lack pulvini and are thus narrow and contracted, it is not uncommon to find an isolated plant or

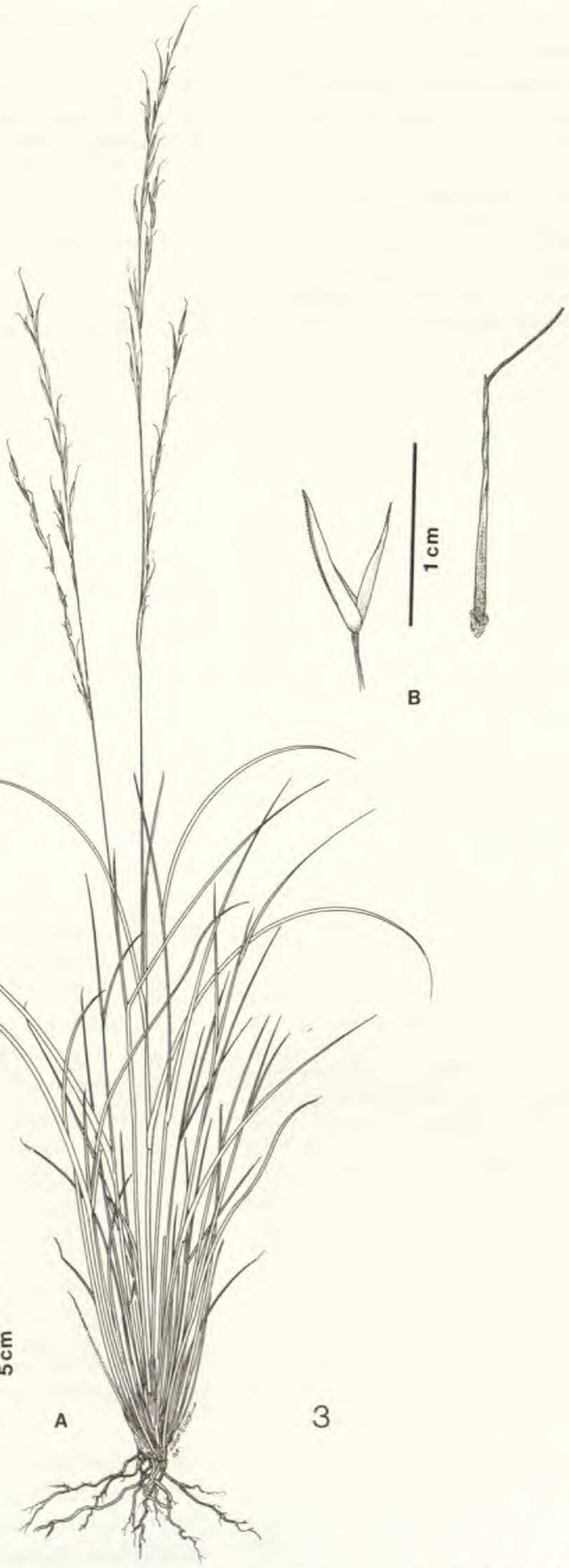

Figure 3. *Aristida eludens* Allred & Valdés-Reyna (*Valdés-Reyna 2254*). —A. Habit. —B. Spikelet: glumes left, floret right.

two in each population with only the lowermost branch spreading from a single axillary pulvinus. Only one individual from northern Coahuila (*Ibarra s.n.*) has been found to be completely pulvinate (pulvini in all axils).

Paratypes. MEXICO. **Chihuahua:** Sierra Carrasco, ca. 31 mi. NW of Julimes, 6000 ft., 15 Sep. 1973, *J. Henrickson 12965.5* (TEX/LL); Santa Eulalia Mts., 10 Sep. 1885, *C. G. Pringle 386* (TEX/LL); La Campana, 1650 m, 7 Sep. 1973, *J. Valdés-Reyna 148* (TAES). **Coahuila:** Sierra de la Paila (lado norte), cañada becerros, 1700 m, 13 Oct. 1989, *J. A. Villarreal 5469* (ANSM); 12 km al W de Saltillo, carr. 40, 2000 m, 9 July 1983, *J. Valdés-Reyna & L. Rodriguez 1522* (ANSM); San Lorenzo Canyon, ca. 8 km S of Saltillo, mountain scrub grassland vegetation with *Berberis, Bouteloua, Hilaria, Dasylirion*, very rocky sandy loam, flat bajada on N-facing side of canyon, anthers 1.5 mm, 6000 ft. (1829 m), 3 Sep. 1991, *K. W. Allred & J. Valdés-Reyna 5488, 5491, 5492, 5495, 5497* (ANSM, NMCR); Est. Carneros, Carneros Pass, steep hills W of town, very rocky calcareous soil along cobble road to microwave tower, desert grassland/scrub vegetation with *Yucca carnerosana, Agave, Nassella, Aristida curvifolia*, 6750 ft. (2057 m), 5 Sep. 1991, *K. W. Allred & J. Valdés-Reyna 5527, 5528* (ANSM, NMCR); Sierra Garcia, San Lazaro Pass, desert mountain scrub vegetation with ocotillo, lechuguilla, *Acacia*, and *Opuntia*, limestone N-facing steep slopes, 1200 ft. (366 m), 6 Sep. 1991, *K. W. Allred & J. Valdés-Reyna 5540* (ANSM, NMCR); San Lorenzo Canyon, 25 Aug. 1981, *S. L. Hatch 4501* (ANSM, TAES); Carneros, camino a torre de microondas, 3 km al poniente de la estación, 30 km al S de Saltillo, matorral de *Yucca carnerosana, Pinus cembroides, Dasylirion cedrosanum, Ceanothus greggii, Nassella tenuissima*, 17 Oct. 1986, *J. Espinosa-A. 97, 186* (ANSM, NMCR); San Lorenzo Canyon, 22 Aug. 1980, *M. Madrigal-A. s.n.* (TAES); Sierra de Parras en Los Chupaderos, 14 Apr. 1981, *A. Rodriguez s.n.* (CIIDIR-DURANGO); Estación Carneros, camino torre de microondas, 2100 m, 24 May 1982, *J. Valdés-Reyna 1456* (TAES, US); 18 mi. S of Saltillo on hwy. 54, just W of Est. Carneros, 2250 m, 18 Oct. 1989, *P. Peterson 8416* (ANSM, US); Cañon San Lorenzo, 1900 m, 22 Aug. 1980, [no collector] (TAES); Mpio. Arteaga, 10 mi. NE of hwy. 57 at Los Alpes, with pinyon, *Yucca, Agave*, 24 Aug. 1983, *S. L. Hatch 5022* (ANSM, NMCR, TAES); Mpio. Saltillo, Cerro del Pueblo, al W de la ciudad de Saltillo, 11 Sep. 1990, *J. Valdés-Reyna 2055* (ANSM, NMCR); Mpio. Ocampo, Rancho La Rueda, *D. Ibarra s.n.* (ANSM). **Durango:** 45 km WNW of Huejuquilla El Alto, 1830–2150 m, 23 Oct. 1983, *D. E. Breedlove 59212* (CAS, MO). **Guanajuato:** 30 km SE of San Felipe on hwy. 37 to León, rocky slopes in open grassland, 2290 m, 30 Aug. 1990, *P. M. Peterson 9693* (ANSM, NMCR, US); oak slopes ca. 12 mi. on rd. between Guanajuato and Santa Rosa, 30 Sep. 1946, *H. E. Moore, Jr. 1351* (US). **Oaxaca:** 19.5 km NW of Tlaxiaco and 12.3 km NE of San Juan Mixtepec, near jct. of road to Yosonama, sandy slopes with pine, oak, and manzanita, 2410 m, 3 Sep. 1990, *P. M. Peterson 9736* (ANSM, NMCR, US). **Nuevo León:** near Puerto México along hwy. 57, 22 Aug. 1983, *S. L. Hatch 5011* (ARIZ, TAES). **Querétaro:** 5 km al NE de Bernal, sobre la carretera a Tolimán, ladera caliza con vegetación de matorral xerófilo, 1950 m, 10 Nov. 1988, *Rzedowski s.n.* (ANSM, NMCR). **San Luis Potosí:** Mpio. Villa de Arriaga, Cerro del Gallo, 2500 m, 3 Oct. 1962, *E. Herndandez-X. 1413* (ANSM); mountain slopes, 13 mi. S of San Luis Potosí, 7100 ft., 2 Sep. 1939, *F. Shreve 9307* (US); near village of San Francisco in Sierra de San Miguelito, ca. 25 km SW of San Luis Potosí, pine/oak, 22–2400 m, 5 Sep. 1954, *E. R. Sohns 1062* (US); Cnyn. del Muerto, ca. 3 km W of Rodrigo, in Sierra de San Miguelito, 1800–2200 m, 18 Sep. 1954, *E. R. Sohns 1317* (US); ca. 5 mi. SW of city in hills, 18 July 1950, *J. R. Reeder 1372* (ARIZ).

Several specimens from central Mexico approach *Aristida eludens* in having single awns and narrow panicles, but differ in being very tall (to 1.5 m) robust plants with knotty bases and curling blades, and in occurring in oak and pine/oak forests. They are here excluded from *A. eludens* and are tentatively considered aberrant forms of plants normally with spreading panicle branches. Duplicates of some of these were referred by McVaugh (1983) to *A. schiedeana* or *A. laxa*.

Excluded from *A. eludens:* MEXICO. **Jalisco:** Autlán, 1290 m, 5/XI/1975, *C. Castro 84* (MEXU); near Villa Guerrero, Cerro del Aquila, 25 Sep. 1980, *A. Beetle 5811* (MEXU); Paso de la Troje, near km 36, SW of Ojuelos on rd. to Aguascalientes, 2100–2300 m, 9–12 Aug. 1958, *R. McVaugh 16818* (US); Rio Blanco, 6 Oct. 1886, *E. Palmer 476* (MO); Rio Blanco, June–Oct. 1886, *E. Palmer 517.5* (US); Rio Blanco, June–Oct. 1886, *E. Palmer 769* (US); Mpio. Mezquitic, 5 km E of Rancho El Mortero, pine/oak, 2200 m, 5 Nov. 1963, *Rzedowski 17687* (US). **Morelos:** Alarcán, 31 Aug. 1910, *C. Orcutt 3863* (MO). **Puebla:** 35 km de Tetela, 1550 m, 1/VIII/1981, *S. Contreras 534* (MEXU).

Aristida spanospicula Allred, Valdés-Reyna & Sánchez-Ken, sp. nov. TYPE: Mexico. Chihuahua: Sierra Madre Occidental, at Cuesta Prieta, along road from San Juanito to Creel, 3.1 mi. S of San Juanito, pine forest with scrub oak understory of *Lupinus, Muhlenbergia*, and *Trisetum*, thin forest loam calcareous soil, numerous clumps among the scrub oak, 7500 ft. (2280 m), 22 Sep. 1992, *K. W. Allred & J. Valdés-Reyna 5787* (holotype, NMCR; isotypes, ANSM, NMC, TAES). Figure 4.

Species nova *Aristidae schiedeanae* affinis laminis planis saepe torsivis scobiformibus, paniculis angustis absque pulvinis axillaribus, spiculis paucis dispersis late, glumis magnis spadiceis, rostris exsertis tortis lemmatum, et aristis singularibus a congeneribus Americanae borealis diversa.

Plants perennial, tufted; *culms* (20–)25–55(–60) cm tall, ascending, slender, not branching above the base; *internodes* terete, glabrous to minutely scaberulous. *Leaves* basal, light green to yellowish green. *Sheaths* longer than the internodes, glabrous to sparsely pilose, rounded on the back; *collars* glabrous to sparsely pilose at the corners, lacking a line of hairs across the back; *throats* glabrous ex-

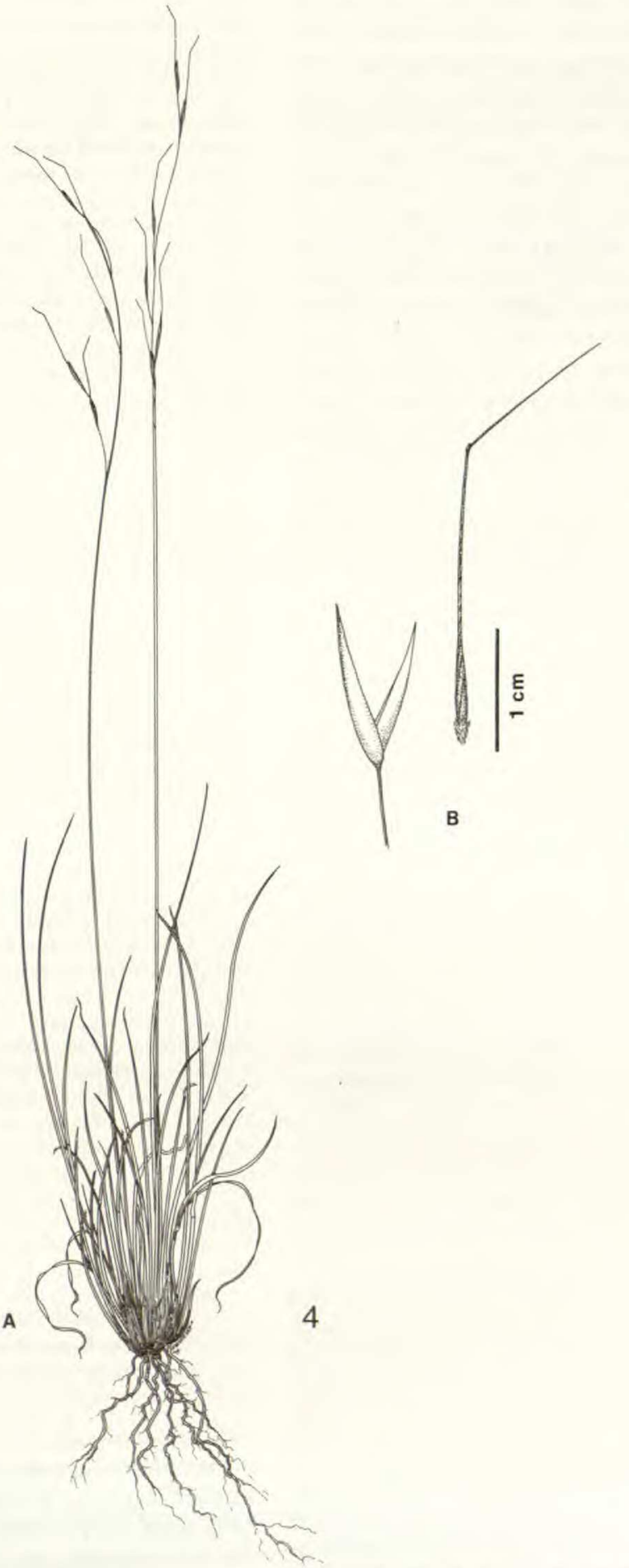

Figure 4. *Aristida spanospicula* Allred & Valdés-Reyna (*Allred 5787*). —A. Habit. —B. Spikelet: glumes left, floret right.

cept for the ligule. *Ligules* a fringe of hairs less than 0.5 mm long. *Blades* flat to loosely folded when fresh, rolled upon drying, usually coiling like wood shavings in age, glabrous abaxially, glabrous to puberulent adaxially, 14–25 cm long, 1.5–2 mm wide when flat, the margins thickened by the coalescence of the outer veins. *Panicles* (8–)12–22 cm long, 1–2 cm wide, few flowered with 3–8(–12) spikelets, often drooping, narrow but loose, the nodes glabrous; *primary branches* weakly developed, appressed-erect, bearing 1–2(–4) spikelets; *pulvini* absent. *Spikelets* few and widely spaced, scarcely overlapping, the pedicels often drooping and somewhat capillary. *Glumes* glabrous to scaberulous, mostly 1-nerved, occasionally a short lateral nerve developed, brownish, subequal or the first 1–2 mm shorter or longer, 9–15 mm long. *Lemmas* glabrous, (16–)18–22(–25) mm long from the base of the callus to the divergence of the awns; beak twisted, exserted beyond the glumes, (6–)8–10(–15) mm long; *central awn* not twisted, geniculate-bent at ca. 90°, 10–16(–20) mm long; *lateral awns* highly reduced, erect, less than 0.5 mm long; *callus* 0.5–1 mm long with stiff hairs less than 1 mm long. *Paleas* completely enclosed by the lemmas, 2-nerved, membranous, ca. 1 mm long, shorter than the lodicules. *Stamens* 3, the anthers light brown, ca. 2 mm long. *Lodicules* 2, flabellate, 1–1.5 mm long. *Caryopses* fusiform, brown, 7–9 mm long.

Flowering August–October. *Distribution.* As yet, found only in pine/oak forests of the Sierra Madre Occidentale, often on nearly bare ground, usually rocky or crumbly calcareous soil; Mexico, in the states of Chihuahua, Durango, and Sonora (Fig. 2).

We are pleased to cooperate with Jorge Sánchez-Ken, of the Herbario Nacional de México (MEXU), in describing this new species. The epithet *spanospicula* alludes to the panicles with few spikelets.

Aristida spanospicula differs from others in the complex by the epulvinate panicle, fewer spikelets, and longer lemmas. It is apparently restricted to the pine/oak forests of the Sierra Madre Occidental in northern Mexico. *Aristida spanospicula* occasionally grows intermingled with *A. schiedeana,* and some of the sympatric populations contain intermediate plants suggesting hybridization or incomplete morphological delineation of the species. The latter would not be uncommon in *Aristida.*

Paratypes. MEXICO. **Chihuahua:** ca. 6 mi. S of Creel, rocky outcrops near small stream, in ponderosa pine community with 5-needle pine and juniper, sandy loam soil, 22 Aug. 1985, *K. W. Allred 3074* (NMCR); Cascada Basaseachic Overlook on S side of canyon, very steep N-facing slopes in oak/pine forest, with *Quercus crassifolia, Arbutus,* 6600 ft. (2012 m), 11 Sep. 1987, *K. W. Allred 4607* (NMCR); 4 mi. W of Cuesta Blanca in the Sierra Brena, approximately 32 road mi. SW of Col. Juarez, pine-oak woodland with a very sparse understory, rocky gravelly soil, 6500 ft. (1981 m), 21 Sep. 1992, *K. W. Allred & J. Valdés-Reyna 5745, 5746* (NMCR); Sierra Madre Occidental, 11 mi. W of Babicora on hwy. 180 to Madera, pine-oak forest with sparse grass understory of *Bouteloua, Muhlenbergia, Piptochaetium,* rocky loam soil, 6800 ft. (2072 m), 22 Sep. 1992, *K. W. Allred & J. Valdés-Reyna 5776* (ANSM, NMCR); Sierra Madre Occidental, at Cuesta Prieta, along road from San Juanito to Creel, 3.1 mi. S of San Juanito, pine forest with scrub oak understory of *Lupinus, Muhlenbergia,* and *Trisetum,* thin forest loam calcareous soil, approaching *A. schiedeana,* 7500 ft. (2280 m), 22 Sep. 1992, *K. W. Allred & J. Valdés-Reyna 5792* (ANSM, NMCR); Cusarare, S of Creel, 14 Sep. 1973, *Bye, R. 5047* (TEX/LL); Sánchez, rocky pine woods, 8000 ft., 12 Oct. 1910, *A. S. Hitchcock 7671* (US); Chuhuichupa, Aug.–Sep. 1936, *Lesueur 6112* (CAS, MO, TEX/LL); Colonia Cumbres de Majalca, approx. 32 km W of hwy. 45 N of Chihuahua, table rock and rocky slopes with oak, pine, juniper, and *Arctostaphylos,* 23 Sep. 1988, *P. M. Peterson 5810* (ANSM, NMCR, US); 43.5 km W of Balleza and 51.6 km E of Guachochi, sandy, clay flats with pine, oak, and *Arctostaphylos pungens,* 2320 m, 18 Sep. 1991, *P. M. Peterson et al. 10756* (ANSM, NMCR, US); Parque Nacional Barranca del Cobre, 24.8 km NE of La Bufa on road to Samachic, gentle slopes in forest of pine, oak, and *Arbutus,* 2440 m, 20 Sep. 1991, *P. M. Peterson et al. 10799* (ANSM, NMCR, US); pine-oak region, Sierra Madre occidental, W of Casas Grandes, 3 mi. W of Cuesta Blanca, 2073 m, 4 Sep. 1958, *J. R. & C. G. Reeder 3214* (ARIZ, US). **Durango:** Sierra Madre Occidental, mountains E of Durango City, approximately 30 mi. E of the city at the movie set for "Fat Man and Little Boy," deep barrancas in pine/oak/manzanita communities, soil chalky, calcareous, very crumbly, 7500 ft. (2286 m), 24 Sep. 1992, *K. W. Allred & J. Valdés-Reyna 5831, 5837* (ANSM, NMCR); Sierra Madre Occidental, along hwy. 40 from Durango City to El Salto, 30 mi. W of Durango, pine/oak/arctostaphylos woodland with thick grass understory of *Muhlenbergia, Trachypogon,* slight slope, loam soil, 8400 ft. (2560 m), 24 Sep. 1992, *K. W. Allred & J. Valdés-Reyna 5845* (ANSM, NMCR); Sierra Madre along hwy. 40 from Durango City to El Salto, 32 mi. W of Durango, adjacent to Parque El Tecuan, pine savannah parkland with 5-needle pine, gently W-facing slope, grass understory of *Aristida, Panicum,* forest loam soil, 8000 ft. (2438 m), 24 Sep. 1992, *K. W. Allred & J. Valdés-Reyna 5851* (ANSM, NMCR). **Sonora:** E of Cananea, pine woods, Sierra de los Ajos, 26 Sep. 1981, *A. A. Beetle 7859* (MO).

The relationship of *A. schiedeana* and *A. orcuttiana* has long been problematical. Dávila & Sánchez-Ken (1994), Gould & Moran (1981), and Pohl & Davidse (1994) treated the two as conspecific without distinction; Henrard (1927, 1928, 1929) treated the two as distinct species; Hitchcock treated them both ways (conspecific in 1924, distinct in 1935); and Beetle (1983) presumably treated the two as conspecific, though he does not mention *A. orcuttiana* in the text at all, even though the type is from Baja California Norte. Table 1 presents the salient differences between the two taxa. Although

the morphological distinctions are incomplete and difficult to interpret, they are separated geographically (Fig. 5). *Aristida orcuttiana* is here relegated to varietal status under *A. schiedeana:*

Aristida schiedeana Trinius & Ruprecht var. **orcuttiana** (Vasey) Allred & Valdés-Reyna, comb. nov. Basionym: *Aristida orcuttiana* Vasey, Bull. Torrey Bot. Club 13: 27. 1886. SYNTYPES: Mexico. Baja California Norte: Hansen's Ranch, 6000 ft., 30 July 1883, *C. R. Orcutt 507* (lectotype, selected here, US). U.S.A. Arizona: *M. E. Jones* (not seen).

KEY TO THE MEMBERS OF THE *ARISTIDA SCHIEDEANA* COMPLEX:

1a. Panicles open, all the primary branches with axillary pulvini and spreading sharply outward from the main axis upon exsertion of the panicle from the sheath and throughout maturity.
  2a. Lemmas with three well-developed awns, the lateral awns at least ¼ the length of the central awn . . . . . *A. laxa* Cavanilles (We use the name *A. laxa* Cavanilles in its traditional sense, although Sánchez-Ken (pers. comm.) informs us that in the type of *A. laxa*, the lateral awns are nearly absent; there may be difficulties with the application of this name.)
  2b. Lemmas with a single well-developed awn, the lateral awns minute or at most ¼ the length of the central awn . . . . . *A. schiedeana* Trinius & Ruprecht
    3a. First glume usually equal to or shorter than the second; glumes usually scabrous; blade above ligule usually with scattered pilose hairs; collar usually with a line of short hairs . . var. *schiedeana*
    3b. First glume usually longer than the second; glumes usually glabrous; blade above ligule usually glabrous; collar usually lacking a line of hairs . . . . . var. *orcuttiana* (Vasey) Allred & Valdés-Reyna
1b. Panicles closed, contracted, none of the primary branches (or occasionally only the lowermost) with axillary pulvini and thus not spreading from the axis, though the branch tips or spikelets may droop outward.
  4a. Lemmas (16–)18–22(–25) mm long (from the base of the callus to the divergence of the awn); panicles few flowered, with 3–12 loosely disposed spikelets . . . . . *A. spanospicula* Allred & Valdés-Reyna
  4b. Lemmas less than 10–13 mm long (from the base of the callus to the divergence of the awn); panicles densely flowered, with 16 or more congested spikelets . . . . . *A. eludens* Allred & Valdés-Reyna

Table 1. Comparison of *Aristida schiedeana* Trinius & Ruprecht and *A. orcuttiana* Vasey.

	A. schiedeana	*A. orcuttiana*
Pilose hairs above ligule	Usually present	Usually absent
Collar hairs	Usually present in a line	Usually absent
Glume pubescence	Usually scabrous	Usually glabrous
Glume 1 length (mm)	6–15 usually equal to glume 2	6–14 usually longer than glume 2
Glume 2 length (mm)	8–14	5–10(–13)
Central awn length (mm)	(5–)7–15	5–14
Lateral awn length (mm)	0.3–1.5(–4)	0–3(–7)
Distribution (Fig. 5)	North-central Mexico to Nicaragua	Southwestern United States to northern Mexico

ARISTIDA PURPUREA NUTTALL COMPLEX

The *Aristida purpurea* complex has tightly involute to loosely folded blades, panicles without axillary pulvini (except in two varieties), and strongly unequal glumes, the first much shorter than the second. Its members are common in arid and semiarid plains and deserts, and include *A. purpurea* s.l. (Allred, 1984), *A. brownii* Warnock, and *A. curvifolia* Fournier.

Aristida purpurea Nuttall var. **perplexa** Allred & Valdés-Reyna, var. nov. TYPE: U.S.A. New Mexico: Doña Ana County, USDA Jornada Experimental Range, ca. 16 mi. NE of Las Cruces, pasture 12, ca. 4800 ft., sandy soil, very common, 15 July 1986, *K. W. Allred 4035* (holotype, NMCR). Figure 6.

Varietas nova *Aristidae pansae* et *A. purpureae* similis; ab *A. pansa* arachnoideis destitutis angulis vaginarum, glumis inaequalibus (primis secundis brevioribus), et aristis longis ascendentibus differt; ab *A. purpurea* paniculis apertis habentibus pulvinos axillares differt.

Plants perennial, tufted; *culms* (30–)40–65 cm tall, erect, simple or sparsely branched at the base; *internodes* terete, glabrous to puberulent. *Leaves* basal and cauline, yellowish to pale green. *Sheaths* rounded on the back, glabrous to puberulent, with longer hairs at the summit; *collars* usually with a line of short stiff hairs across the back, the corners glabrous or with a tuft of erect, straight to somewhat crinkly hairs (but not cobwebby) ca. 1 mm long; *throats* puberulent in addition to the ligule. *Ligules* a fringe of hairs ca. 0.5 mm long. *Blades* rolled when fresh, sometimes only loosely folded, usually glabrous abaxially and puberulent adaxially, mostly

Figure 5. Geographic distributions of *Aristida schiedeana* Trinius & Ruprecht var. *schiedeana* (open circles) and variety *orcuttiana* (Vasey) Allred & Valdés-Reyna (closed circles).

8–20 cm long and less than 1 mm wide, arcuate to curling upon drying. *Panicles* (8–)10–26 cm long and (4–)6–12 cm wide, open, pyramidal; *primary branches* stiffly ascending to widely spreading from axillary pulvini, sometimes somewhat flexuous or capillary, naked at the base, the lower ones 3–6 (–8) cm long; *pulvini* present in the axils of the primary branches but usually absent from the pedicels, the spikelets thus appressed along the branches. *Glumes* glabrous, membranous to scarious, light tan, strongly unequal and the first ½ to ¾ the length of the second, 1-nerved, the first (4.5–) 5–7(–7.5) mm long, the second 8–11(–12) mm long. *Lemmas* glabrous to scabrous, often mottled, (8–) 10–12(–13) mm long from the base of the callus to the divergence of the awns; *beak* usually not twisted, reaching about to the tip of the second glume or slightly beyond, 2.5–3.5(–4) mm long and 0.1–0.2 mm wide; *awns* subequal, mostly spreading 40–50°, rarely approaching 90° from the vertical, the central awn (1.5–)2–3 cm long, the lateral awns 2–4 mm shorter; *callus* 0.5–1 mm long with short stiff hairs ca. 0.5 mm long. *Paleas* completely enclosed by the lemmas, membranous, acute, 2-nerved, 1–1.3 mm long. *Stamens* 3, the anthers 0.7–1.5 mm long. *Lodicules* 2, flabellate, 1–1.4 mm long. *Caryopses* fusiform, light brownish.

Flowering July–October. *Distribution.* Sandy to rocky plains and mesas in desert grassland/scrub communities, often calcareous soil; Mexico, in the states of Chihuahua, Coahuila, and San Luis Potosí; United States, in the states of Arizona, New Mexico, and Texas (Fig. 7).

The epithet *perplexa* refers to the prior confusion of this variety with *Aristida pansa*.

Because of its spreading panicle branches, specimens of variety *perplexa* have long been confused with *Aristida pansa* Wooton & Standley. The new variety differs from this latter species by its lack of cobwebby hairs at the collar (a feature consistent throughout the *A. pansa* complex), by the acuminate unequal glumes (the first ½–¾ the length of the second), and by the longer awns (mostly 2–3 cm vs. 1.5 cm or less), which generally ascend at an angle of 40–50° rather than being nearly horizontal.

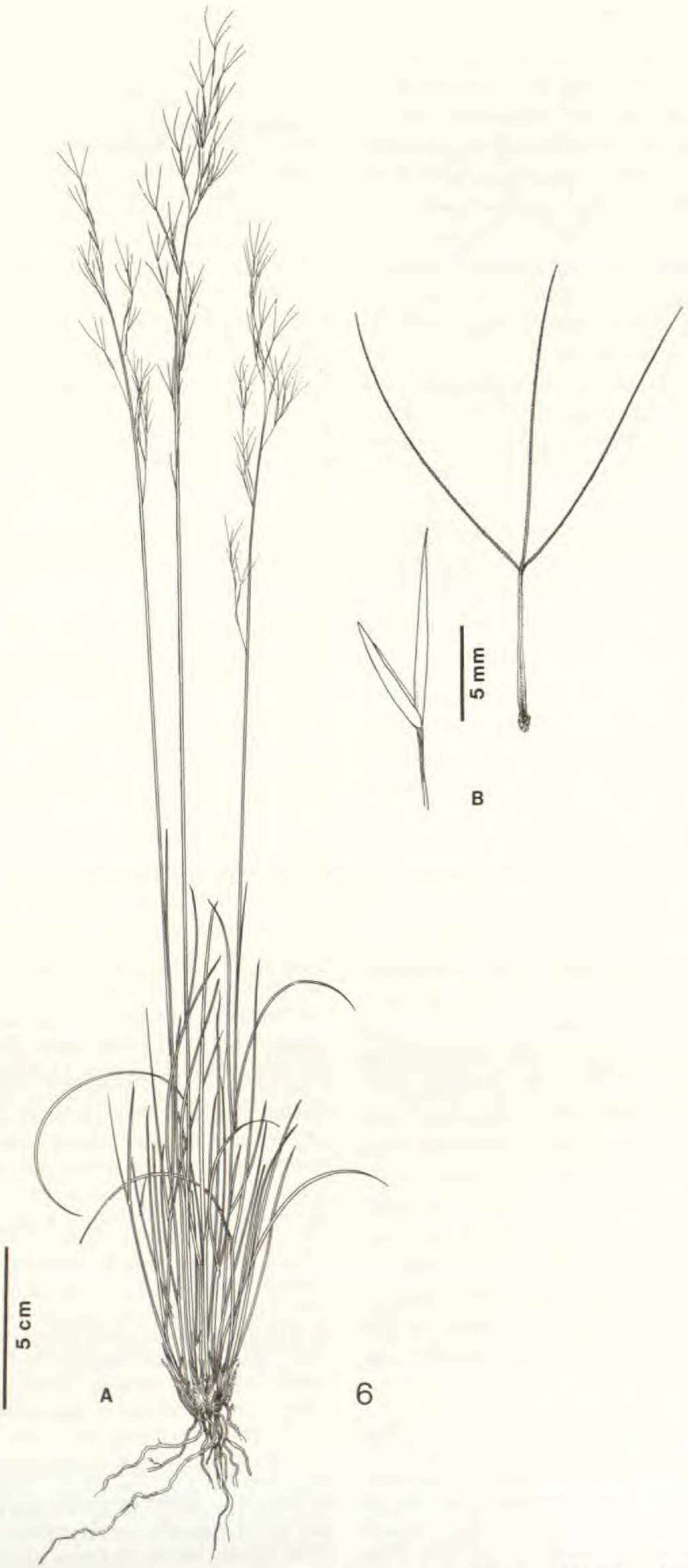

Figure 6. *Aristida purpurea* Nuttall var. *perplexa* Allred & Valdés-Reyna (*Peterson 10632*). —A. Habit. —B. Spikelet: glumes left, floret right.

Figure 7. Geographic distribution of *Aristida purpurea* Nuttall var. *perplexa* Allred & Valdés-Reyna.

The spikelets of variety *perplexa* are essentially identical to spikelets of *A. purpurea* var. *purpurea*. Variety *perplexa* may grow in homogeneous isolated populations (the type locality) or be sympatric with *A. pansa* and other varieties of *A. purpurea*, as is the case at the type locality of *A. pansa* in Doña Ana County, New Mexico. Variety *perplexa* is the second variety in the *A. purpurea* complex with spreading, pulvinate panicle branches. The other, variety *parishii* (A. S. Hitchcock) Allred, which is restricted to Sonoran Desert habitats, is similar to variety *wrightii* (Nash) Allred and often lacks the axillary pulvini so that the panicle is narrow or spicate. The panicles of variety *perplexa*, however, are consistently pulvinate.

Paratypes. MEXICO. **Chihuahua:** just S of New Mexico border near Columbus, rocky hills, 15 Oct. 1983, *K. W. Allred 2629* (NMCR); Sierra Las Pampas, N end of the sierra along dirt road from Las Pampas to jct. with road to Camargo, 6.2 mi. SE of jct., Chihuahuan Desert Scrub, rocky calcareous slope, 4500 ft. (1372 m), 23 Sep. 1992, *K. W. Allred & J. Valdés-Reyna 5806, 5807* (NMCR); near Chihuahua, 13 Oct. 1885, *C. G. Pringle s.n.* (POM/RSA). **Coahuila:** 16.9 km NE of San Miguel on road towards Boquillas, 1180 m, 13 Sep. 1991, *P. M. Peterson 10608* (ANSM, NMCR, US); Sierra El Pino, 9.2 km SW of Rancho El Cimarron along the eastern slope, calcareous rocky slopes, 1500 m, 14 Sep. 1991, *P. M. Peterson 10632* (ANSM, NMCR, US); near La Rosa, 5000 ft., 18 Aug. 1940, *F. Shreve & E. R. Tinkham 4593* (ARIZ). **San Luis Potosí:** along hwy. 49 from Zacatecas to San Luis Potosí, 32.4 mi. E of Salina, 21 mi. W of San Luis Potosí, desert thorn scrub community, rocky soil, 6200 ft. (1890 m), 26 Sep. 1992, *K. W. Allred & J. Valdés-Reyna 5873, 5874, 5875* (NMCR); along hwy. 57 at jct. to San Jose del Refugio, gypsum, 1340 m, 20 Oct. 1978, *J. R. Reeder 7052* (ARIZ). U.S.A. **Arizona:** Cochise Co., along Cascabel to Willcox road, near 8 mi. marker, rocky limestone slope with ocotillo, Agave and grasses, 1450 m, 25 Aug. 1992, *J. R. & C. G. Reeder 8878* (ARIZ, NMCR); 1 mi. NW of Naco (Waco?), 6 Oct. 1936, *L. N. Goodding 389* (ARIZ); Apache Pass between Dos Cabezas and Chiricahua Mts., Siphon Cnyn., 1450 m, 23 Aug. 1993, *J. R. Reeder 9020* (ARIZ). Pima Co., Santa Rita Mts., hwy. jct. E of Vail, 3000 ft., 7 Sep. 1938, *L. Benson 9121* (ARIZ). **New Mexico:** Bernalillo Co., 3 mi. W of Albuquerque, 9 Oct. 1945, *R. A. Darrow 3367* (ARIZ). Chaves Co., Hwy. 380 ca. 15 mi. W of Caprock, 8 July 1982, *K. W. Allred 2314* (NMCR); 3.5 mi. E of Elkins on hwy. 70, sandy, oak-*Artemisia*-grassland, 26 Aug. 1974, *L. C. Higgins 9172* (NMC). Doña Ana Co., Ropes Spring, San Andres Mts., 17 Aug. 1933, [collector unknown] *89* (NMCR); 7 mi. W

of Hatch at jct. of hwy. 26 and 85, 2 Oct. 1982, *T. Potter 17* (NMCR); Las Cruces, 6 Oct. 1904, *D. Griffiths 7417* (NMCR); near Tortugas Mt., 24 Oct. 1904, *E. O. Wooton s.n.* (NMC); White Sands Missile Range, 5 km E of headquarters, 200 m S of Nike Ave., granitic sandy bajada, 23 Sep. 1990, *R. Spellenberg 10678* (NMC). Eddy Co., abt. 40 mi. E of Roswell, 7 mi. N of hwy. 380, Mather Natural Area, sandy, shin oak, 3 Aug. 1979, *R. Spellenberg 5249* (NMC). Guadalupe Co., 2 mi. S of Vaughn, 15 July 1979, *L. Rockhill 20* (NMCR). Luna Co., Cooke's Range, Provinger Draw, 12 Aug. 1986, *J. T. Columbus 419* (NMCR); 5 mi. W of Columbus, 9 July 1984, *J. S. Trent 107* (NMCR). Socorro Co., ca. 12 mi. E of San Antonio along hwy. 380, 5 July 1984, *K. W. Allred 2700* (NMCR); roadside E of Belen on hwy. 60, 7 Apr. 1952, *E. F. Castetter 7962* (NMC). Valencia Co., 20 mi. NE of Suwanee, 1 Sep. 1935, *K. W. Parker 633* (NMCR). **Texas:** Culberson Co., deep sand 21 mi. W of Kent, 4000 ft., 17 Aug. 1950, *B. H. Warnock 9317* (SR); dunes near Salt Flats, 4000 ft., 29 Aug. 1965, *B. H. Warnock 20678* (SR); at Salt Flat Station, E of Salt Flat, 4000 ft., 29 Aug. 1965, *B. H. Warnock 20674* (SR). Pecos Co., limestone hills 20–35 mi. S of Ft. Stockton, along Sanderson hwy., 3100 ft., 1 July 1955, *B. H. Warnock 13266* (SR).

Aristida brownii Warnock (Warnock, 1982) was described to accommodate single-awned *Aristida* (the lateral awns highly reduced) otherwise identical to *A. purpurea* var. *wrightii*. Since its description from Brewster County, Texas, individuals of this entity have been found from other Texas localities, several locations in southern New Mexico, and one locality in Coahuila, Mexico. Plants of *A. brownii* are always found intermingled with variety *wrightii*, usually in sparse numbers, and never as isolated homogeneous populations. In addition, it is not uncommon to find in the same population with typical *A. brownii* plants with lateral awns ¼–¾ the length of the central awn, an attribute intermediate between *A. brownii* and the sympatric variety *wrightii*. We find the recognition of this taxon untenable at the species level. Because the single-awned feature is unique in *A. purpurea* s.l. and easily confused with other taxa, we propose its recognition at the level of forma. We have placed the name in a 3-level hierarchy to indicate its affinities within *A. purpurea*, i.e., *A. purpurea* var. *wrightii* forma *brownii*.

Aristida purpurea Nuttall forma **brownii** (Warnock) Allred & Valdés-Reyna, comb. nov. Basionym: *Aristida brownii* Warnock, Sida 9: 358. 1982. TYPE: U.S.A. Texas: Brewster County, widespread perennial on limestone hills of Del Norte Mountains, elevation 4600 ft. or more, 27 June 1981, *Warnock 141* (holotype, Lajitas Museum, not seen; isotypes, SMU, TEX).

Allred (1984) reduced *Aristida curvifolia* Fournier to a variety of *A. purpurea* because its strongly unequal glumes are also characteristic of the other varieties of *A. purpurea*. Further field studies during the subsequent 10 years have shown that disposition to be unwarranted, and we propose the reinstatement of this taxon at the species rank, as did Dávila & Sánchez-Ken (1994). *Aristida curvifolia* is consistently distinguished from all other desert *Aristida* by the following features: blades stiff, tightly involute, yellow-green, the epidermis nearly smooth and the veins hardly noticeable; glumes broad, blunt, unequal; lemma beak (apex) 1–2 mm long, 0.2–0.5 mm wide, straight to only slightly twisted even when mature; panicles spicate, always epulvinate. *Aristida curvifolia* often grows with both *A. purpurea* and *A. pansa*, and no evidence of hybridization or intermediacy has been noted. Indeed, this taxon turns out to be one of the more uniform species of *Aristida* in North America. It is presently known from 12 states in Mexico: Aguascalientes, Baja California Norte, Chihuahua, Coahuila, Guanajuato, Nuevo León, Oaxaca, Puebla, San Luis Potosí, Tamaulipas, Veracruz, and Zacatecas.

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